

## DETAILED ACTION

### ***Claim Rejections - 35 USC § 103***

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. **Claim 1** is rejected under 35 U.S.C. 103(a) as being unpatentable over Ueda et al. (Noise and Life of Helical Timing Belt Drives”), and further in view of Araki et al. (US Patent 4,840,608).

**As per claim 1**, Ueda et al. discloses a helically-toothed-belt transmission device for transmitting driving force by meshing between a helically-toothed belt and a helically-toothed pulley, the device being characterized in that:

when denoting a tooth pitch as "Pt", a tooth helix angle as "θ", and a belt width of said helically-toothed belt as "W", said tooth helix angle "θ" is set in a range of

$$-0.2 \leq 1 - W \cdot \tan \theta / Pt \leq 0.75.$$

From Ueda et al. in page 274, “Forms and Dimensions of Test Belt and Pulleys”, the combination of helix angle 10 degree, pitch value of 8 mm, and belt width of 20 mm, it lies between the range of -0.2 and 0.75, (that is 0.55) as recited in claim 1.

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However, Ueda et al. silent about a backlash between said helically-toothed belt and said helically-toothed pulley is set to be from 1.6% to 3% of said tooth pitch "Pt".

Araki et al. discloses Toothed Belt with relation between pitch and backlash. In table 2, of Araki et al. column 1, belt with Cycloidal tooth has pitch value of 9.525 and corresponding backlash is 0.15. It is close to the Ueda et al. belt combination.

It would have been obvious to one ordinary skill in the art at the time the invention was made to modify the belt of the Ueda et al. to choose the belt and pulley combination with toothed belt and said helically-toothed pulley is set to be from 1.6% to 3% of said tooth pitch as taught by Araki et al. in order to provide low noise belt and pulley sets and get optimal performance.

3. **Claim 2** is rejected under 35 U.S.C. 103(a) as being unpatentable over Ueda et al. (Noise and Life of Helical Timing Belt Drives"), and further in view of Takehara et al. (US Pub. No.: 2005/0096433 A1), and Wujick (US Patent 4,403,979).

**As per claim 2**, Ueda et al. discloses a helically-toothed belt and a helically-toothed pulley, the device being characterized in that:

when denoting a tooth pitch as "Pt", a tooth helix angle as " $\theta$ ", and a belt width of said helically-toothed belt as "W".

However, Ueda et al. said tooth helix angle " $\theta$ " is set in a range of

$$1 - W \cdot \tan \theta / Pt \leq 0$$

Ueda et al. in page 274, "Introduction", describe that "in the present study, various helical timing belt are produced, and the noise and life of each type belt are experimentally compared with these of the conventional belt, and described in page 275 (second column, first paragraph), "in the case of helical timing belt, the noise level decreased when the helix angle increased.

Takehara et al. discloses Power Transmission Belt with test the belt with the dimension of tooth pitch 5 mm, with 60 teeth, and a belt width of 60 mm.

Choosing the belt of Takehara et al. which is pitch of 5 mm and width of 60 mm to modify to helix angle of 5 degree (from teaching of Ueda), using the formula recited limitation of claim2,

$$1 - W \cdot \tan \theta / Pt \leq 0$$

The modified belt satisfied the limitation (that is -0.05) which is less than zero as recited in claim 2.

Again, Ueda et al. and Takehara et al. both silent about compressibility of said helically-toothed belt is set to be from 1.5% to 5%.

Wujick discloses compression of the belt teeth in table I, combination of B and C being 3.4%, which falls in the range of 1.5% to 5%.

It would have been obvious to one ordinary skill in the art at the time the invention was made to use the belt of the Ueda et al. to applied in the Takehara et al. to make the helix angle of 5 degree and appropriate tooth height as taught by Wujick in order to achieve a better and noise reduction belt.

***Response to Arguments***

4. Applicant's arguments, see REMARK, filed November 30, with respect to the rejection(s) of claim(s) 1 and 2 under USC 103(a) have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of Ueda et al. (Noise and Life of Helical Timing Belt Drives").

***Conclusion***

5. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to SAN AUNG whose telephone number is (571)270-5792. The examiner can normally be reached on Mon-to- Fri 7:30 am- to 5:00 pm..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Robert Siconolfi can be reached on 571-272-7124. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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